BUILDING ENERGY CODES PROGRAM

Setting the Standard

U.S. Department of Energy • Office of Energy Efficiency and Renewable Energy

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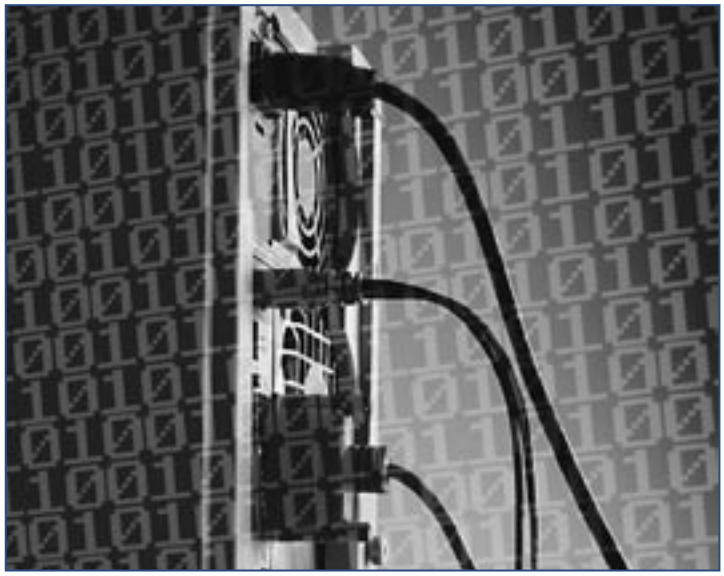

Selecting Appropriate Building Energy Simulation Software

What building energy simulation software is appropriate for use with the Energy Cost Budget method in ASHRAE Standard 90.1 or the Total Building Performance section of the IECC?

Both methods list specific requirements for simulation programs. For the Energy Cost Budget (ECB) method, the requirements are found in Section 11.2.1 of *ANSI/ASHRAE/IESNA*[1] Standard 90.1-2004 (and 90.1-2001 and 90.1-1999 as well). It states that the simulation program shall be "a computer-based program for the analysis of energy consumption in buildings. The simulation program shall include calculation methodologies for the building components being modeled. The simulation program shall be approved by the adopting authority and shall at a minimum have the ability to explicitly model all of the following:

- A minimum of 1400 hours per year
- Hourly variations in occupancy, lighting power, miscellaneous equipment power, thermostat setpoints, and HVAC system operation, defined separately for each day of the week and holidays
- Thermal mass effects
- Ten or more thermal zones

The simulation program shall also be capable of performing design load calculations to determine required HVAC equipment capacities and air and water flow rates.

- Part-load performance curves for mechanical equipment
- Capacity and efficiency correction curves for mechanical heating and cooling equipment
- Air-side and water-side economizers with integrated control

In addition, the simulation program shall have the ability to either directly determine the design energy cost and energy cost budget *OR* produce hourly reports of energy use by energy source suitable for determining the design energy cost and energy cost budget using a separate calculation engine. The simulation program shall also be capable of performing design load calculations to determine required HVAC equipment capacities and air and water flow rates. The simulation program shall also be tested according to ASHRAE Standard 140 and the results shall be furnished by the software provider."

For the Total Building Performance (TBP) method in the International Code Council's International Energy Conservation Code (IECC), the appropriate reference is Section 506 of the 2006 IECC (also found in Section 806 of the 2003 or 2000 IECC). Section 506 does not go into as much detail as the ECB method, but the requirements are similar. The TBP method requires the use of an approved energy simulation tool. Climate data, energy costs, and building operation for 8,760 hours are required. Part-load performance and capacity curves are also referenced. There is also mention of HVAC system design capacity. The TBP method does have more specific documentation requirements than the ECB method, requiring annual energy use and associated costs, a list of energy-related features, input and output report(s), and a written explanation of any error or warning messages.

Some well known tools that meet these requirements include DOE's EnergyPlus software, DOE-2 (with many variants such as PowerDOE and Equest), BLAST, Trane Trace and Carrier HAP. There are numerous other programs that may also be used. DOE maintains an extensive directory of energy software tools at http://www.eere.energy.gov/buildings/tools_directory/.

[1]The American National Standards Institute / American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. / Illuminating Engineering Society of North America.

Can Energy Code Compliance Tools Be Used To Determine EPAct 2005 Tax Incentives?

The short answer is NO – but with one notable exception!

The Energy Policy Act of 2005 (EPAct) provides a variety of tax incentives for homeowners, businesses, and manufacturers for purchase of energy-efficient equipment; completion of new energy-efficient buildings; and improvements to existing buildings that are put in place after January 1, 2006, and before December 31, 2007. References and links to details on the various tax incentives can be found at U.S. DOE Tax Incentives for Energy-Efficient Buildings and Products. (www.eere.energy.gov/buildings/info/tax_credit_2006.html)

The U.S. Department of Energy's **RES*check***™ and **COM*check***™ software tools are designed solely for energy code compliance. The "percent improvement" provided for envelope (**COM*check***™ and **RES*check***™) and lighting (**COM*check***™) are not based on a whole building or performance-based approach which is the basis for the primary EPAct tax incentive. Therefore, **RES*check***™ and **COM*check***™ cannot be applied to them.

However, the commercial tax incentives in EPAct provide for an **interim rule** for **lighting only** that is not based on building energy modeling. The interim rule requirements are based on a simpler prescriptive calculation basis. This interim rule requires verification of a reduction in installed lighting power density below the levels in the ASHRAE/IESNA[2] Standard 90.1-2001 that can be easily calculated using **COM*check***™. This article provides answers to frequently asked questions about the interim lighting rule, including how **COM*check***™ can be applied as part of the process in receiving a tax deduction.

What are the requirements for applying the interim lighting rule?

The interim tax deduction applies to lighting property placed in service between December 31, 2005, and January 1, 2008, that meets the following requirements:

1. Achieves a reduction in lighting power density of at least 25 percent (50 percent in the case of a warehouse) of the minimum requirements in ASHRAE/IESNA Standard 90.1-2001 Table 9.3.1.1 or Table 9.3.1.2 (not including additional interior lighting power allowances of Standard 90.1-2001).
2. Has controls and circuiting (wiring) that comply fully with the mandatory and prescriptive requirements of ASHRAE/IESNA 90.1-2001 (Lighting Section 9).
3. Includes provision for bi-level switching in all occupancies except hotel and motel guest rooms, store rooms, restrooms, and public lobbies.
4. Meets the minimum requirements for calculating lighting levels as set forth in the IESNA Lighting Handbook, Performance and Application, Ninth Edition, 2000.

This article provides answers to frequently asked questions about the interim lighting rule, including how **COM*check***™ *can be applied as part of the process in receiving a tax deduction.*

Is whole building energy modeling necessary to get the interim lighting deduction?

No. The interim lighting rule is based on a percentage reduction in lighting power densities below specified levels. Whole building energy modeling is not applicable to the interim rule.

Can the tax deduction be applied to lighting retrofits?

Yes. However, only the cost of any newly installed lighting is eligible for tax deduction.

How can COM*check*™ help determine a potential tax deduction?

The U.S. Department of Energy's COM*check*™ **software can be used to calculate the percentage reduction in a project's lighting power density compared to Standard 90.1-2001 that forms the basis for the dollar value of the tax deduction. COM*check***™ **can also be used to document compliance with the controls and wiring requirements.**

How do I use COM*check*™ to calculate the project's lighting power density reduction for a potential lighting tax deduction?

1. After starting the software, go to the Code menu on the taskbar and select "90.1 (2001) Standard."
2. Select the Project tab.
    1. Select the type of project from the options under Project Type.
    2. For new construction, select "New Construction."
    3. For an addition, select "Addition."
3. Select "Whole Building" or "Area Category (Space-by-space)" under Building Use. Either path can be used for the tax deduction.
4. Select type of building or space categories from the pop-up list and enter the applicable square footage(s).
5. Select the Lighting tab and define all the components of the final lighting system as it will be after project completion.
    1. Press the button for the appropriate type of lighting: Linear Fluorescent, Compact Fluorescent, HID, or Incandescent.
    2. Enter the lighting system details. Note: additional lighting power allowances cannot be used.
    3. Repeat steps 5.1 and 5.2 until the entire lighting system is entered. This may include existing lighting if the project is a retrofit or remodel, but only the cost of the newly installed lighting will be eligible for tax deduction.
6. Check the Lighting Percentage value in the lower right hand corner of the screen. If the lighting design passes by more than 25 percent (better than "+25%" shown in green), you are eligible for a tax deduction. If the project does not achieve better than a 25 percent reduction, do not proceed further as the project will not be eligible for any deduction with the interim rule.
7. From the File menu, select View/Print Report.
8. Select Lighting Compliance Certificate and select OK to generate a PDF of the certificate.
9. Print the Lighting Compliance Certificate.

The Lighting Compliance Certificate will note that Standard 90.1-2001 was used for compliance comparison and will display the percentage that the design is better than the Standard in the shaded box at the bottom. This is your self-documentation of eligibility for the tax deduction based on the reduction in lighting power density over Standard 90.1-2001[3]. The certificate will also provide a checklist of the controls and wiring requirements of Standard 90.1-2001 that must be met.

What version of COM*check*™ do I need to perform the calculations?

Any version of COM*check*™ that includes compliance with ASHRAE/IESNA 90.1-2001 (COM*check*™ versions 2.5 and above) will provide the necessary calculations. The latest version of the software is available at www.energycodes.gov.

Can I apply any of the "exemptions" or "allowances" in COM*check*™ for purposes of the tax deduction?

You can use any of the exemptions that apply. However, the tax provision specifically prohibits the use of any of the additional lighting power allowances.

Can I use COM*check*™ to document the bi-level switching and IESNA light level calculation requirements?

Standard 90.1-2001 does not require bi-level switching, so documentation of this will not be available on this application of COM*check*™. You can find some information on compliance with typical bi-level switching requirements at www.energycodes.gov/training/commercial_training.stm in the IECC 2000/2001/2003 training presentation for Lighting. IESNA light level recommendations are not included in the COM*check*™ software. They can be found in the IESNA Lighting handbook.

Can COM*check*™ be used to calculate any non-lighting tax deduction values?

No. Non-lighting tax deductions require the use of whole building energy modeling, which is not a feature of COM*check*™.

How is the actual lighting deduction calculated?

The maximum possible deduction is calculated on a sliding scale based on the percentage reduction in lighting power density your project achieves compared to the lighting power density level limits in Standard 90.1-2001. The portion of the $0.60 per-square-foot your lighting project is eligible for will range from $0.30 at only 25 percent lighting power density reduction to the full $0.60 at 40 percent lighting power density reduction according to the following formula:

Maximum available deduction ($) = $0.60(100 – (31/3*(40 - % LPD reduction))).*

Typical Deduction Amounts Sample							
% Reduction in LPD Over 90.1-2001	25%	28%	31%	34%	37%	40%	50% (warehouse)
Available Tax Deduction ($/ft^2)	$0.30	$0.36	$0.42	$0.48	$0.54	$0.60	$0.60

What other resources are available?

For guidance on the commercial building tax deduction, see the Internal Revenue Service website: www.irs.gov/newsroom/article/0,,id=158395,00.html.

For condensed information on the tax credits, visit the following websites:

- NEMA Commercial Building Tax Deduction Coalition
- American Council for an Energy-Efficient Economy News Release

U.S. DOE Provides Technical Assistance for States Considering New Codes

The U.S. Department of Energy (DOE) offers specific analytical assistance to states that are considering adoption of upgraded model energy codes, Standard 90.1-2004 for all buildings except low rise residential buildings, and the 2006 IECC. DOE can analyze the energy and cost impacts of proposed code changes in your state and provide a report to the state for use in their adoption process. DOE has provided dozens of these reports over the years for both residential and commercial code adoptions by states, and occasionally municipalities. For a list of state-specific analysis reports, see http://www.energycodes.gov/implement/tech_assist_reports.stm. DOE can also make state-specific modifications to its compliance software and training materials. See http://www.energycodes.gov/implement/doe_assist_states.stm for examples of assistance DOE has provided.

Here's how your state can request technical assistance from DOE:

Contact Tim Eastling at the National Energy Technology Laboratory (NETL), which is responsible for DOE's Buildings Programs, including Building Codes, now that the DOE regional offices have been closed. Tim can be reached at timothy.eastling@netl.doe.gov or (412) 386-4770. Tim will need a formal request on state letterhead to initiate this process.

If you have questions about State Technical Assistance, you can submit them through DOE's Building Energy Code Program's User Support at http://www.energycodes.gov/support/helpdesk.php.

If you have an idea about analytical needs in your state and you are not with affiliated with the state energy office, please discuss your idea with the state energy office so they can request this assistance if appropriate. Visit the following link to identify your state energy office contact: http://www.energycodes.gov/implement/state_codes/index.stm.

To see what code activity is happening in your state visit the Building Codes Assistance Project at http://bcap-energy.org/home.php.

2006/2007 ICC Code Development Hearings

The 2006/2007 Code Development Hearings are scheduled for September 20 – October 1, 2006. Stay tuned for the results of the hearings. All results will be available on the International Code Councils' website at http://www.iccsafe.org and a summary of the results will be in the next issue of the Setting the Standard newsletter.

Give Us Your Input on Creating Reports in RES*check*™ and COM*check*™

Earlier versions of **RES*check***™ and **COM*check***™ created reports in Rich Text Format (RTF). In current versions of the software, the RTF report format has been replaced with a PDF formatted report.

After this change occurred, some users indicated that they had difficulty importing the PDF reports into AutoCAD or similar programs in a manner they were accustomed to with RTF reports. Although a work around (http://resourcecenter.pnl.gov/html/ResourceCenter//1528.html) is available for users experiencing difficultly migrating reports to AutoCAD, upcoming releases of **RES*check***™ and **COM*check***™ will include an option to create a RTF report in addition to the PDF report.

So that we can adapt the report features to the long-term needs of the user community, please take a moment to tell us more about how, or if, you use the reports with other programs and in particular your need and use of RTF reports. Please provide this valuable feedback by visiting http://energycode.pnl.gov/EnergySurvey/entry.jsp?id=1156788472374.

COMcheck™ REScheck™

[2]American Society of Heating, Refrigerating, and Air Conditioning Engineers/Illuminating Engineering Society of North America

[3]Although **COM*check***™ is not an officially recognized IRS software tool for the permanent tax rule, it is applicable in providing the lighting power density reduction percentage needed for the interim tax deduction calculation. PNNL-SA-50842 .

Energy Codes Website Attracts Multitude of Users

The U.S. Department of Energy's Building Energy Codes website, www.energycodes.gov, has averaged more than 3 million hits per month in 2006. In March, the site logged **an all-time high** of 3,796,355 hits. Web stats continue to show increases in code compliance software downloads, the use of videos and web-based tools, and accessing the Resource Center.

New This Year – Online Self-paced Training Tools

Codes 101—a new, self-paced training tool—is now available online. The training provides a basic understanding of codes and standards; development processes of each; historical timelines; adoption, implementation, and enforcement of energy codes and standards; and voluntary energy efficiency programs. Codes 101 joins two other self-paced tools that already are available, **RES*check***™ 101 and **COM*check***™ 101. All are accessible at http://www.energycodes.gov/training/onlinetraining/online_training.stm. Continuing education credits are available. A fourth self-paced training tool on Area Takeoffs will be available soon. DOE has also supported ASHRAE in the development of its 90.1-2004 course materials. Materials will soon be available at http://www.ashrae.org.

Upcoming Software Updates Reflect User Preferences

All versions of **RES*check***™ and **COM*check***™ will soon offer users the option to specify Preferences. Preference options include: setting a code, location, and contact information for owner/agent and designer/contractor for new projects; designating the names, titles, and number of signature lines for compliance certificates; designating contact information to be used when emailing reports; and more. An option to generate reports in RTF format will once again be included in the software, fulfilling a popular request. The Beyond Code Advisor, which offers links to information about energy efficiency opportunities in buildings, will soon be added to the **COM*check***™ tools. **RES*check***™ and **COM*check***™ desktop versions will also include compliance for the 2006 International Energy Conservation Code (IECC).

First Annual Jeffrey A. Johnson Award for Excellence in the Advancement of Building Energy Codes and Performance Winner Announced

The U.S. Department of Energy (DOE) is pleased to announce the first recipient of the Jeffrey A. Johnson Award for Excellence in the Advancement of Building Energy Codes and Performance. Bill Pennington, Manager of the Buildings and Appliances Office at the California Energy Commission (CEC), was presented with the award during a plenary session on August 1 at the 2006 National Workshop on State Building Energy Codes in Denver, Colorado. The award recognizes a leader or team in the United States for sustained service of the highest caliber in the pursuit of energy efficiency goals. http://www.energycodes.gov/jaj/jajohnson_06winner.stm.

Building Energy Codes Training Progresses at an Astounding Pace

In 2006, more than 6,370 attendees participated in Building Energy Code Program's webcasts on various subjects ranging from residential and commercial requirements of the 2006 IECC, log homes, and alterations to commercial buildings. American Institute of Architects/CES Learning Units and continuing educations credits towards International Code Council renewal certification are available for all live events and for those who view the recorded webcast in video format. In addition, states provide training through BECP grants. In FY2006, state trained approximately 5,419 people.

Past Events

The final installment (Lighting) of the three-part series on the Commercial Requirements of the 2006 IECC was presented by Eric Richman, Pacific Northwest National Laboratory, on July 13, 2006. More than 3,800 people participated in the three classes. Videos of this and other past events are available online at http://www.energycodes.gov/training/onlinetraining/videos.stm.

The National Workshop on State Building Energy Codes occurred July 31 through August 3, 2006 in Denver, Colorado. This year's event attracted an all-time high of 258 attendees including architects, builders, code officials, energy code advocates, industry/trade associations, and model code organizations. The workshop participants included attendees representing energy-related organizations in 35 states and territories. In addition, pre- and post-workshop trainings totaled more than 270 attendees. For more information on the training, building tours, and presentations, visit http://www.energycodes.gov/news/2006_workshop/presentations.stm.

Upcoming Events

A webcast, *On the Road to the 2009 IECC*, will be held on October 26, 2006. More information is available at www.energycodes.gov.

For a complete calendar of upcoming energy code-related training events, visit http://www.energycodes.gov/events/index.php.